



The effect of water storage change in ET estimation in humid catchments based on water balance models and Budyko framework

Tingting Wang (1,2), Fubao Sun (1), Changming Liu (1), Wenbin Liu (1), and Hong Wang (1)

(1) Key Laboratory of Water Cycle and Related Land Surface Processes, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China, (2) University of Chinese Academy of Sciences, Beijing, 100049, China

An accurate estimation of ET in humid catchments is essential in water-energy budget research and water resource management etc, while it remains a huge challenge and there is no well accepted explanation for the difficulty of annual ET estimation in humid catchments so far. Here we presents the ET estimation in 102 humid catchments over China based on the Budyko framework and two hydrological models: $abcd$ model and Xin'anjiang mdoel, in comparison with ET calculated from the water balance equation (ET_{wb}) on the ground that the ΔS is approximately zero at multiannual and annual time scale. We provides a possible explanation for this poorly annual ET estimation in humid catchments as well. The results show that at multi-annual timescale, the Budyko framework works fine in ET estimation in humid catchments, while at annual time scale, neither the Budyko framework nor the hydrological models can estimate ET well. The major cause for this poorly estimated annual ET in humid catchments is the neglecting of the ΔS in ET_{wb} since it enlarge the variability of real actual evapotranspiration. Much improvement has been made when compared estimated $ET + \Delta S$ with those ET_{wb} , and the bigger the catchment area is, the better this improvement is. It provides a reasonable explanation for the poorly estimated annual ET in humid catchments and reveals the important role of the ΔS in ET estimation and validation. We highlight that the annual ΔS shouldn't be taken as zero in water balance equation in humid catchments.